

# **MOVABLE MOUNTING BED APPARATUS OF SPRING FORMING MACHINE**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

**[0001]** The present invention relates to a movable mounting bed apparatus of a spring forming machine that can be moved forwards and backwards along an axial direction for adjusting the axial finishing space of the working center thereof, so as to facilitate the forming apparatuses mounted onto the mounting bed to make special finishing.

### **2. The Related Art**

**[0002]** In manufacturing spring, a conventional spring forming machine feeds a spring wire in continuous via a wire feeding apparatus into a mounting bed apparatus and uses a plurality of forming apparatuses mounted onto the mounting bed to first bend and fold an end of the spring wire to form a bending hook with a specially designated angle, subsequently wind the spring wire to form a spring body, then bend another end of the spring body to form another bending hook and finally cut the spring wire to get a finished spring.

**[0003]** A finished spring has two bending hooks next to the spring body thereof, which can be manufactured in success by a conventional spring forming machine. However in need of manufacturing a special spring with an extension portion, the working center of the mounting bed needs a larger axial finishing space. The conventional spring forming machine generally uses the following two ways:

**[0004]** (1) The first one is to form a spring by first making a semi-finished spring and then proceed with a secondary finishing. A disadvantage is that the manufacturing time and cost thereof is increased.

**[0005]** (2) The second way is to provide between the mounting bed and the forming apparatus with a pedestal to enlarge the axial finishing space of the working center of the mounting bed. A disadvantage is that to assemble and disassemble the pedestal increases the resetting time of the forming apparatuses and thus decreases the working efficiency thereof. In addition, because the pedestal elevates the forming

apparatus, in case of forming a spring, the deflection of the spring wire increases. Therefore the finishing precision of the spring is not apt to be controlled.

### SUMMARY OF THE INVENTION

[0006] An object of the present invention is to provide with a movable mounting bed apparatus of a spring forming machine for solving the above-mentioned problems. The mounting bed has sliding seats and linear sliding rails thereunder that can make the mounting bed moving forwards and backwards along an axial direction for adjusting the axial finishing space of the working center thereof, so as to facilitate the forming apparatus mounted onto the mounting bed to directly manufacture a special spring with an extension portion.

[0007] In comparison with the twice-finishing way of a conventional spring forming machine, the present invention can finish a special spring with an extension portion at a time that can save the manufacturing time and cost.

[0008] In comparison with a conventional spring forming machine providing between the mounting bed and the forming apparatus with a pedestal, the mounting bed of the present invention can make an axial movement for adjusting the axial finishing space of the working center thereof. There is no need of an extra resetting time of the forming apparatuses. Therefore the working efficiency thereof can be raised. In addition, because the forming apparatus of the present invention does not be elevated, in case of forming a spring, the rigidity of the spring wire is not weakened and the deflection thereof does not increase. Therefore the finishing precision thereof can be raised.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1 is a front perspective view of a movable mounting bed apparatus of a spring forming machine in accordance with the present invention;

[0010] Figure 2 is a rear perspective view of a movable mounting bed apparatus of a spring forming machine of the present invention;

[0011] Figure 3 is an analytic perspective view of the movable mounting bed apparatus of a spring forming machine of the present invention;

**[0012]** Figure 4A is a top view of the movable mounting bed apparatus of the present invention;

**[0013]** Figure 4B is a front view of the movable mounting bed apparatus of the present invention;

**[0014]** Figure 4C is a side view of the movable mounting bed apparatus of the present invention;

**[0015]** Figure 5A shows a general spring; and

**[0016]** Figure 5B shows a special spring with an extension portion.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

**[0017]** The configurations, advantageous features and effectiveness of the present invention will be apparent to those skilled in the art after reading the detailed description of the preferred embodiment thereof in reference to the accompanying drawings.

**[0018]** Referring to Figure 1, a movable mounting bed apparatus of a spring forming machine in accordance with the present invention comprises a mounting bed 1, a mounting bed base 11, a servomotor 12 (see Figure 2), a shaft coupling 121, a ball screw 13, a screw seat 131, four sliding seats 14, two linear sliding rails 15, a sliding rail base 16, a wire feeding apparatus supporting base 21, a foundation 4, a wire feeding apparatus 2 and six forming apparatuses 3.

**[0019]** On the rim of the mounting bed 1 has six rim protrusion portions 111 each respectively being mounted with a forming apparatus 3. The bottom of the mounting bed 1 is mounted to a mounting bed base 11. The mounting bed base 11 has a bottom protrusion portion 112 having a screw hole 113 engaged with a ball screw 13. An end of the screw hole 113 is embedded with a screw seat 131. Both sides of the bottom of the mounting bed base 11 respectively have a groove 115 each respectively mounted with two sliding seats 14. The two sliding seats 14 are engaged with a linear sliding rail 15 mounted to a sliding rail base 16. The mounting bed 1 is provided on the center thereof with a central hole 114 for receiving the front end of a wire feeding apparatus supporting base 21. The space between the front edge of the central hole 114 and the six forming apparatuses 3 forms a working center 116.

**[0020]** The bottom of the sliding rail base 16 is mounted to a foundation 4. On the top of the sliding rail base 16 has a protrusion portion 161, both sides of which are respectively mounted with a linear sliding rail 15. The linear sliding rail 15 is engaged with two sliding seats 14 mounted to the groove 115 of the mounting bed base 11.

**[0021]** The mounting bed base 11 is mounted via the engagement of the sliding seats 14 with the linear sliding rails 15 to the sliding rail base 16. And the mounting bed 1 is mounted to the mounting bed base 11. Therefore the mounting bed 1 can make an axial movement forwards and backwards for adjusting the axial finishing space of the working center 116 thereof.

**[0022]** Referring to Figure 2, the foundation 4 has a recess 41 and is mounted with a sliding rail base 16. A servomotor 12 is received in the recess 41 of the foundation 4. The servomotor 12 is mounted with a shaft coupling 121, another end of which is mounted to the ball screw 13. The ball screw 13 is penetrated through the screw seat 131 embedded into an end of the screw hole 113 of the bottom protrusion portion 112 of the mounting bed base 11. Then the ball screw 13 is engaged with the screw hole 113 (see Figure 1). When the servomotor 12 rotates, the ball screw 13 is driven to make the mounting bed base 11 movement forwards and backwards along the linear sliding rail 15. The transmission way of the ball screw 13 can be replaced with an oil cylinder or a gas cylinder.

**[0023]** Both sides of the recess 41 respectively have a supporting block 42 for supporting a wire feeding apparatus supporting base 21 that supports a wire feeding apparatus 2. The front end of the wire feeding apparatus supporting base 21 can pass through the central hole 114 of the mounting bed 1. In manufacturing spring, the spring forming machine feeds the spring wire via the wire feeding apparatus 2 into the working center 116 of the mounting bed 1 and then uses the six forming apparatuses 3 mounted onto the mounting bed 1 to finish a spring. Because the mounting bed 1 can make an axial movement forwards and backwards for adjusting the axial finishing space of the working center 116 thereof, the forming apparatuses 3 mounted thereon can directly manufacture a special spring 5 with an extension portion 53 (see Figure 5B).

**[0024]** Figure 3 is an analytic perspective view of the movable mounting bed apparatus of the spring forming machine of the present invention, which shows the number of various parts and the combination relationship thereof. Figures 4A, 4B and 4C are respectively a top, front and side views of the movable mounting bed apparatus of the present invention, which show a more clear structure of the present invention.

**[0025]** Figures 5A and 5B respectively show a structure of a general spring and a special spring. The special spring 5 has an extension portion 53 except having a spring body 51 and a bending hook 52. The mounting bed 1 of the present invention can make an axial movement forwards and backwards for adjusting the axial finishing space of the working center 116 thereof for manufacturing a general spring and a special spring with an extension portion 53. There is no need of an extra resetting time of the forming apparatuses 3 as a conventional spring forming machine. Therefore the working efficiency thereof can be raised.

**[0026]** The above statements are only for illustrating the preferred embodiment of the present invention, and not for giving any limitation to the scope of the present invention. It will be apparent to those skilled in this art that all equivalent modifications and changes shall fall within the scope of the appended claims and are intended to form part of this invention.